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MEASURES TO MAKE MATHEMATICS RELEVANT IN THE REAL WORLD: 2020 NATIONAL EDUCATION POLICY

Rakhesh Narain*, Sachin Vats

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Abstract

The policy for higher education that will be in place for the next 15 years recommends a great deal of different adjustments. These changes include interdisciplinary education, flexibility in educational programmes, integration of vocation education with the mainstream school, implementation of blended learning approaches, and integration of research into all educational programmes. The cultivation of learners who continue their education throughout their lives is the central objective of the policy. In every aspect of its operations, the Indian government is making concerted efforts to achieve the goal of Atmanirbhar Bharat. The transition between industry 4.0 and industry 5.0 is now underway. Higher education institutions are required to educate students who can learn throughout their lives, can study in an environment that is dynamic, and can do their tasks in a competent and proficient manner in light of all the changes that have occurred in the country. Heutagogy is a school of thought that has to be embraced by educational establishments of higher learning in order to handle the difficulties provided by many stakeholders. The purpose of this paper is to provide a brief description of the rationale for adapting the philosophy of heutagogy, the concept of heutagogy in the context of NEP 2020, the purpose of implementing heutagogy, the role of the learners, the constraints to the implementation of heutagogy, and strategies for effectively implementing heutagogy.

Keywords: Heutagogy, national education policy, role of learner.

1. INTRODUCTION

India is going to be self-reliant on all dimensions of functioning such as economic, social, environmental, political, cultural, and educational. The government of India has initiated innovations using mission mode in all areas of functioning of the country. The national education policy is a milestone towards self-reliant India. The vision of quality education and excellence in higher education can be achieved using the principles of andragogy and heutagogy (MHRD, 2020).

There has been continuous research on the learning process in different contexts for achieving different purposes. In different contexts, many theories and models have evolved which have been used for years. The well-established philosophies are pedagogy and andragogy which are used for child learning and adult learning respectively. The heutagogy is emerging as a new philosophy of learning in the education and training for twenty-first-century learners. The accessibility of information anywhere at any time has made it easy for individuals to learn what they want to learn. Learners of higher education are opting for certification of additional competencies, hobby-related competencies, and value-added competencies. They are doing so because the learning opportunities are easily available. The NEP 2020 has envisioned a multidimensional approach for higher education incorporating the requirements of twenty-first century learners (MHRD, 2020).

In the last five decades, many innovations have been designed and implemented for higher education through policy interventions which have significantly improved the quality of education. There are two important aspects related to education and training i.e., the ability and proficiency to be developed and how it is developed. The philosophy of pedagogy, andragogy, and heutagogy is related to how aspect of learning from the learner's perspective in contrast to the teacher's perspective (Jayantibhai V. Patel, 2018).

The 21st century has initiated very fast changes in all walks of life be it economic, social, technological, political, and the like. People are going for innovations using technology and information technology. The political parties are organizing e rellies, universities are offering online education and training, financial transactions are being made online, the government is shifting to e-governance and digitization, automated manufacturing and quality assurance is being implemented in all industries, food is being served at homes and whatnot. There are millions of learners and teachers who developed several competencies during COVID 19 period as the

Department of Management Education, National Institute of Technical Teachers' Training and Research, Bhopal, M. P. India
*Corresponding author email- r-narain@nitttrbpl.ac.in

training programmes were available for free at their figure tip at their place.

The mentors and resource persons were experts in their field. learners have registered for those training programmes, seminars, conferences, webinars that were related to their immediate and distant needs of learning. Their learning was not governed by programme structure and curriculum, but it was governed by their needs and aspirations related to their career. The teachers as well as students become flexible, adaptable, creative, critical, self-directed, self-determined for learning and developing the competencies. The COVID 19 situation of learning has proved that teachers, as well as students, have the potential capability and capacity to go to any extent for their learning when it is meaningful and within their reach (Yogianti dwi Rahayu Wismaningrum, 2020).

2. CONCEPT OF HEUTAGOGY IN THE CONTEXT OF NEP 2020

The concept of heutagogy is still evolving in the context of higher education. Various synonymous terms are being used in literature i.e., self-directed learning, self-determined learning, autonomous learning (Uday, 2019). It is a science of effectively implementing the learner-centric and learner-determined instructional process for developing learning outcomes in individual learners using information technology. The learning abilities, learning process, learning resources, assessment of learning is decided by the learners. (Uday, 2019) enumerated the journey of evolution of heutagogy and gave different roles of the teacher and continuum of pedagogy, andragogy, and heutagogy. (Hase, 2001) states that the concept of heutagogy is based on the humanistic theory of learning. He states that heutagogy will provide optimal learning in the 21st century. (Hase, 2001) stated the key principles of heutagogy as learner activity, self-efficacy, capability, reflection, metacognition, and non-linear learning. These principles are reiterated by (Narayan, 2019) (Blaschke L. M., 2019) stated that heutagogy is more applicable in a learner-centric and research environment.

Heutagogy encompasses the benefits of theories of humanism, constructivism, capability, connectivism, system thinking, complexity, neuroscience of learning, and reflective learning. In India, the use of SWAYAM and the establishment of a virtual university will change the learning approach of everyone as it is providing access to everyone at any time. The heutagogy is successfully implemented in engineering and science in higher education. (Narayan, 2019) stated five design principles derived from heutagogy. (Kumar, 2020) described the growth mindset. The characteristics of heutagogy are intrinsic motivation, metacognition, capability building, growth mindset, double-loop learning, personal learning environment, cafeteria approach, collaborative learning, non-linear learning, self-efficacy, self-determination, and use of digital media. (Canning, 2010) described strategies to empower mature learners in higher education.

In the backdrop of above review it can be concluded that implementation of self-determined learning in higher education will facilitate the development of well-rounded graduates with lifelong learning abilities.

3. PURPOSE OF IMPLEMENTING HEUTAGOGY IN HIGHER EDUCATION

1. To satisfy the dynamic individualized needs of the learners considering their aptitude, attitude, entry behaviour, and career goals. To make the learning meaningful, purposeful, and satisfying for the learners.
2. To enhance the learning maturity of students to learn in a dynamic and changing environment to deal with the critical issues. The learning maturity will take care of their lifelong learning requirements.
3. To make learners capable to face competitions and new situations on their own. To make them learn from such challenging, competitive, and new situations.
4. To foster double loop and triple loop thinking in students to develop creativity, innovativeness, and critical thinking.
5. To develop learning to learn skills to make the students lifelong learners in any situation, anywhere.
6. To develop thinking to think and refine thinking skills in the context of new and different situations of the world of work.
7. To develop the confidence to overcome critical and complex learning situations.
8. To develop competencies to connect and apply the learning in real-life situations.

4. ROLE OF THE LEARNERS

Learners are the center of the learning process. Heutagogy focuses on self-determined learning. Therefore, the learners are expected to perform an active and dynamic role in the learning process. As the learning processes progress the learner takes over different roles at different stages of the learning process. These roles are related to self and stated in figure 1.

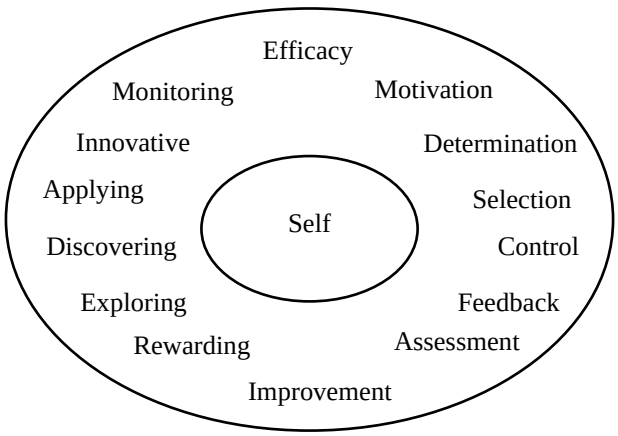

Figure 1 Role of Learners in Heutagogy

1. Self-motivation for learning and developing the competencies and using them in the world of work situations. Self-motivation takes learners towards owning the learning outcomes, make them accountable to self, and empower them to achieve the learning outcomes.
2. Self-determination for achieving the learning and career goals. Learners complete the learning

process on their own with or without external motivation and support.

3. Self-selection of learning competencies from the options available in flexible and cafeteria curriculum design, and multidisciplinary curriculum. This process of self-selection at all stages of the learning process continues till the learning goal is achieved.
4. Self-monitoring of the progress of learning using formative assessment criteria and reflecting on the progress of learning and method of learning.
5. The self-control of the learning resources, learning time, learning efforts, and learning progress
6. Self-feedback on the progress of learning and way of learning plays an important role in improving further learning and way of learning. Self-feedback-taking is a conscious process. The learners are conscious of their process, progress, and way of learning. Self-feedback is promoted making the learners accountable for learning.
7. Self-assessment is carried out against well-defined criteria on the progress of learning and way of learning. Learner's design and implement corrective and preventive measures for assuring learning.
8. Self-improvement is consciously designed and implemented by learners. They continuously set higher and challenging goals for learning and improve the process of learning. The learners get experienced in the learning process which becomes beneficial for improving the next cycle of the learning.
9. Self-rewarding is a way to recognize self-achievements, deriving self-satisfaction on achieving the learning outcomes and using them in the world of work situations.
10. Self-exploring is the way in which learners identify their latent potential for learning and use it for achieving the learning outcomes. Learners know themselves in a better way on dimensions of their personality.
11. Self-discovering is the way to discover better modes of learning. Different learners have different learning styles and they discover different modes of learning to satisfy their learning needs and to create future learning requirements.
12. Self-applying is a way to reinforce learning and enhance proficiency in the specific competency and way of further learning.
13. Self-innovating in the world of work situations. This is done by accepting challenging, multidisciplinary, complex, and unique projects, from the world of work situations. Working on these challenging projects learners innovate mode of learning for further learning. Self-innovative learning is a process of taking students from self-learning (single-loop learning) to reflective learning (double-loop learning) and from reflective learning to innovative learning (triple-loop learning or spiral loop learning) (Caroline M. Crawford, 2018).

5. CONSTRAINTS TO IMPLEMENTATION OF HEUTAGOGY IN HIGHER EDUCATION

There are some constraints to the implementation of heutagogy in higher education. These are lack of competence and proficiency in design, implementation, evaluation, and certification of abilities of the students, fear of power loss of educational leaders and teachers, fear of being obsolete, limited learning resources, the unfamiliarity of students, very few students are governed by an internal locus of control, authoritative culture in educational and research institutions, limited affordability of technology and information technology, access to technology to remote areas, less acceptance of change by stakeholders, lack of industry-oriented learning resources, limited access to industry, lack of integration of research in educational programmes. (Akyıldız, 2019) concluded that educators are not aware of the philosophy of heutagogy.

6. STRATEGIES FOR EFFECTIVE IMPLEMENTING OF HEUTAGOGY IN HIGHER EDUCATION

The strategies are based on the concepts, principles, characteristics, and models proposed by eminent experts and research scholars in different contexts. (Hase and Kenyon, 2001, (Blaschke L. M., 2019).

Strategies at the institute level

Training

Educational leaders and faculty members should be trained to use the philosophy of heutagogy for curriculum design, implementation, assessment of learning, and certification of outcomes in the form of competency or ability, or skills. They should be trained to use the learning platform for purposes such as the development of competency in students, use of learning resources, data management, decision making, creating awareness about the use of philosophy of heutagogy, assessment, certification, motivation for learning, collaborative learning. They should be trained to use philosophy for developing confidence and skills in students to use self-directed learning for developing the abilities of their preference and using the developed abilities in the world of work situations. They should also be trained to design self-learning resources and put them on the learning management system of the institute.

Use of learning e-learning platform

Educational leaders and faculty members should use all types of relevant learning platforms including intensive use of social media for effectively managing the learning of the students. The use of a learning platform should be extended for education, training, continuing education programmes, consultancy, and extension activities.

Shift to learner-centric approaches

Faculty members should come out from traditional and comfortable pedagogical and andragogical approaches and develop their capacity to use e-learning, virtual learning, e tutorials, MOOCs-based programmes on SWAYAM, and other learning systems accessible through

the internet. They should use world-class learning resources to guide the learning of the students.

Offer educational programmes

Offer self-directed education programmes in a blended mode where more focus is on skills development and using the skills to deal with the world of work situations. These programmes should be designed in consultation with the students, industry, and professional society considering the educational trends and best practices of premier institutes of the world.

Create opportunities

Create opportunities for frequent reflection on career goals, learning achievements, the process of learning, and improving the way of learning for the students. Create opportunities for transforming the learning process and thinking process of the students. Encourage students for frequent reflection on the learning process, challenge learning process, and evaluate the learning process (single-loop and double-loop learning) (D, 1974). Make it routine to learn and think for a higher level of learning in terms of capacity, capability, ability, and proficiency.

Create challenges

Create learning challenges and application learning challenges for students to make them creative, critical, and reflective. This process of creating challenges will result in the development of metacognitive abilities in the students. Gradually it will develop students as lifelong learners.

Implement principles of heutagogy

The learning in information technology has proved that learning is not linear in all cases. One can directly learn the skills in 5^{th} generation technology without learning the previous technologies. The same analogy applies to heutagogy. Faculty members may directly create an environment for self-determined learning without practicing the pedagogy and andragogy in the institute.

Create environment

The educational leaders and faculty members need to change their mindset that the students cannot set learning goals and learn on their own. Faculty members cannot learn on behalf of all the students. Faculty members may create an environment for learning. It is the responsibility of the students to develop the ability and proficiency and demonstrate it. NEP 2020 has created ample scope for implementing the heutagogy in higher education. Higher education institutions need to use their autonomy to make a decision and creating an environment for self-determined learning. Establishment of incubation centre in premier institutions is an example of use of heutagogy.

Flexibility in learning

Introduce flexibility for learning in the academic calendar, programme structure, and course plan to incorporate the learning requirements of the students. Introduce flexibility in the learning approach (experimental learning, action learning, project-based learning, observational learning, problem-based learning, creativity sessions, collaborative learning, online learning) of the students. At the institutional level implement the provisions of NEP 2020 related to student's autonomy and their learning. Especially the minor degree, research, and multidisciplinary courses to accumulate course credit.

Guide

Provide links of organizations on the website of the institute for developing specific competencies. Guide students to tap the learning resources for achieving learning outcomes. Guide students in selecting the learning outcomes related to their career goals, solving learning problems, developing learning skills, and using the assessment tools and techniques. Guide the learners to take charge of their learning process right from goal setting to accomplishment of goals. Teachers are available for providing guidance on the learning process at different stages of the learning process. The guidance provided is suggestive and not prescriptive. Teachers guide to transform the learning process of the learners and not the core learning itself.

Encourage

Encourage students to use research-based learning, problem-based, project-based, collaborative, cooperative, and action learning approaches in achieving the learning goals. These approaches will develop learning to learn abilities as the process by-product of the learning. These methods will develop self-learning, self-monitoring, self-assessing, and reflective learning.

Educate

Educate students to ask themselves reflective questions, investigative questions, motivational questions, analytical questions, and evaluative questions during the learning process. Educate students to introspect, reflect and evaluate their learning process on what and how aspects of learning. Educate students to receive intrinsic feedback from the progress of learning and to make the learning achievements as self-rewarding. Educate students to use internal abilities and psychological processes to manage the learning of their choice.

Develop skills

Develop skills for self-determined learning and learner-centered learning. Develop monitoring and review skills and taking preventive and corrective action skills in students related to their learning process. There is a wide range of skills for self-directed and self-managed learning such as diagnose the current and future learning needs of the students based on their aspiration or career vision. Self-motivate to articulate the career goals, decide approaches of learning, identify the source for learning, determine the current issue in learning, sustaining the motivation for learning, self-rewarding, and seeking guidance.

Assessment scheme

Design the assessment scheme which contributes to productive assessment. Meaning thereby it acts as a source of motivation for learning, assessment of learning progress, filling up learning gaps, and taking corrective and preventive actions for improving the learning.

Learning capability

Develop learning capability in students to make them manage their learning and use in the world of work situation for problem-solving, decision making, managing crisis, and planning in a unique way.

Promote

Promote the creative, design, planning, and evaluative activities for the students within the campuses and outside the campus through assignments and activities, projects and research studies, learning platforms, and collaborative learning. Encourage students to take charge of their learning activities with guidance and support required at different points of time during the learning process.

Learning organization

Create the institute as a learning organization involving teachers and students in using systems thinking to shape their learning value system. Encourage the development of learning to learn and thinking to think abilities in the learners and use the developed abilities for developing new competencies and using them in new situations. Create learning groups and learning communities to develop organizational and social competencies. The learning groups and communities may learn on challenging projects and research problems in a collaborative and cooperative mode in a face-to-face situation or using an eLearning platform. Exploit the full potential of heutagogy using the ecosystem stated in figure 2 in a face-to-face and eLearning environment.

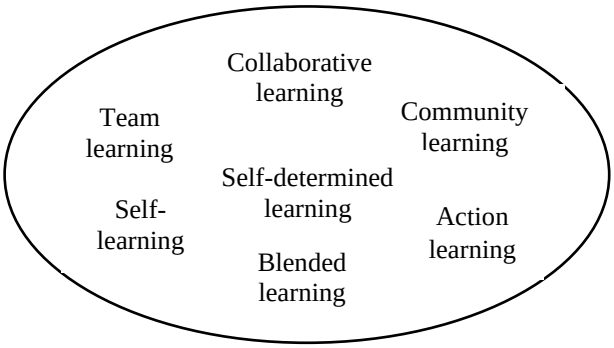

Figure 2 Learning organization using heutagogy

Foster thinking

Foster thinking through open-ended questions and issues. Encourage use of excursion, problem-based learning through complex problem solving, innovative students' projects, creativity sessions, students' debate, search conferences, seminars, action learning, debates, quizzes, educational games, panel discussions, force field analysis, six thinking hats, case methods, action research, and the like. These methods of learning provide opportunities for students with the latent potential to learn on their own and apply learning in a different learning situation. These methods create interest for purposeful learning, reflecting on learning, sharing learning with peers, getting feedback on learning, improving in learning based on self and peers' feedback, use a higher level of learning to learn a further higher level of learning and the like. Through a continuous process of learning, using the learning in different situations they develop learning to learn and thinking to think skills. Over a period of time, they develop lifelong learning skills to manage their learning (Blaschke L. M., 2012).

Multiple roles

Perform multiple roles such as mentor, coach, guide, facilitator, confidence builder, resources provider, problem solver, learning skills developer, and the like.

Scaffolding

Scaffold the learning outcomes and learning process to build upon each other in the learning hierarchy and learning process. The scaffolding should support the further and farther learning achievements of the students.

Facilitator

The course teachers facilitate the complete learning process providing the learning resources, learning activities, assessment tools, reflective questions, exploration questions, and the like.

Strategies at learners' level

Initiatives

Students should take initiative to use the relevant learning resources, case studies, project reports, critique new technology, and techniques, participate in e games and competitions, get involved in collaborative e projects and the like.

Skills

Students should realize that they need to develop learning to learn skills so that they can learn any time when the need arises in their personal and professional life. They can learn to satisfy future learning requirements. Students should develop reflective, inquiry, self-motivational, evaluative, assessment, critical thinking, and creative skills to become lifelong learners. These skills are developed in self-learning, cooperative and collaborative learning environments. Students should develop skills of learning in a limited time and using the ability in a different real-life situation.

Participate

Students should participate in multidisciplinary activities to develop holistic competence to deal with the situation and prevent problems in the future.

Seek guidance

Students should seek guidance from course teachers to develop learning capability and self-determined learning skills. Students should shift from active listener to active learner in a self-managed learning environment as it is done in completing major projects of undergraduate and postgraduate programmes.

Proactive learners

Students should shift from reactive learners (need-based learning) to the proactive learner. They should undertake vision-based learning. The learning should not be confined to immediate learning needs but the future needs also considering the trends in the world of work situation.

Inbuilt reward

Students should make the learning experiences a source of joy and motivation for further learning. They should use

the learning in different familiar and new situations to bring spiral effect in the learning process itself.

Confidence

Students should develop confidence in themselves to learn on their own and use learning in different situations to achieve the results. Students should develop abilities to self-motivate, self-monitor, self-assess, and self-reward for learning accomplishments.

Research

Students should participate in research and development activities of the institute and develop competencies to conduct research activities and contribute to development activities. Students should participate in innovative, competitive, and development-oriented events of the institute.

7. CONCLUSION

It is concluded that the institutions should come forward to implement the philosophy of heutagogy in higher education to develop learning abilities in the students in a dynamic environment. The self-determined learning will make the learning meaningful and purposeful for the students. At the same time provisions of the NEP 2020 can be implemented effectively and efficiently. The educational leaders and faculty members should lead this change to shift from pedagogy and andragogy to heutagogy. The students should be prepared to become lifelong learners.

REFERENCES

Akyıldız, S. T. (2019). Do 21st Century Teachers Know about Heutagogy or Do They Still Adhere to Traditional Pedagogy and Andragogy? *International Journal of Progressive Education, 15*(6), 151-169.

Blaschke, L. M. (2012). Heutagogy and Lifelong Learning: A Review of Heutagogical Practice and Self-Determined Learning. *The International review of Research in Open and Distance Learning, 13*(1), 56-71.

Blaschke, L. M. (2019). Heutagogy and digital media networks: Setting students on the path to lifelong learning. *Pacific Journal of Technology Enhanced Learning, 1*(1), 1-14.

Canning, N. (2010). Playing with Heutagogy: exploring strategies to empower mature learners in higher education. *Journal of Further and Higher Education, 34*(1), 59-71. doi:10.1080/03098770903477102

Caroline M. Crawford, J. Y. (2018). Rethinking Pedagogy, Andragogy and Heutagogy,. *Academic Exchange Quarterly, 22*(4).

D, A. A. (1974). Theory in practice: Increasing professional effectiveness. Jossey-Bass.

Hase, S. K. (2001). Moving from andragogy to heutagogy: implications for VET', Proceedings of Research to Reality: Putting VET Research to Work. *Australian Vocational Education and Training Research Association (AVETRA), Adelaide, SA.*, (pp. 28-30).

Herrington, V. &. (2019). Design principles for heutagogical learning: Implementing student-determined learning with mobile and social media tools. *Australasian Journal of Educational Technology, 35*(3), 86-101.

Jayantibhai V. Patel, R. K. (2018). Paradigm Shift-Pedagogy to Andragogy to Heutagogy in Higher Education. *Weekly Journal of Higher Education, 58*(30).

Kumar, M. R. (2020). Heutagogy: An Effective Self-Determined Approach for Teachers' Continuous Professional Development (CPD). *Studies in Indian Place, 40*(3), 6157-6170.

MHRD. (2020). National Education Policy. Ministry of Education, Government of India.

Narayan, V. H. (2019). Design principles for heutagogical learning: Implementing student-determined learning with mobile and social media tools. *Australasian Journal of Educational Technology, 35*(3), 86-101.

Paul, I. (2020). Heutagogy: An Effective Self-Determined Approach for Teachers' Continuous Professional Development (CPD). *Studies in Indian Place Names, 40*(3), 6157-6170.

Samuel Mann, G. K.-M. (2017). Designing for heutagogy: an independent learning pathway approach. *Capable – Scope: (Flexible Learning), 2*, 59-72.

Uday, Y. (2019). Pedagogy, Andragogy and Heutagogy-Continum and Comparasion. *International Journal of Advanced Research, 7*(8), 1229-1234.

Yogianti dwi Rahayu Wismaningrum, H. J. (2020). Heutagogy Approach: The Implementation of New Normal Era Learning Advances in Social Science, Education and Humanities Research. *Proceedings of the 5th Progressive and Fun Education International Conference (PFEIC 2020), 479*, pp. 189-193.